940,922

PATENT SPECIFICATION

DRAWINGS ATTACHED

940,922

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COMPLETE SPECIFICATION

Improvements in or relating to Fans

We, DAVIDSON & CO., LIMITED, a company organised according to the laws of Great Britain and Northern Ireland, of Sirocco Engineering Works, Belfast 5, Northern Ireland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fans, and particularly to exhauster fans which are incorporated in or associated with pulverised fuel firing equipment.

Fans for this type of service normally are of the radially bladed or paddle blade type with easily renewable blades, because the intense abrasion which takes place across the face of the impeller blades from the dust in the air or gas in its passage through the blades necessitates comparatively frequent blade renewal. For such fans the inlet or suction eye is normally simple, though the fan impeller may possibly have deflector blades attached thereto adjacent the suction eye.

The object of the present invention is to provide improvements in fans of the kind referred to, whereby abrasion of the impeller blades by dust in the air or gas is substantially reduced.

According to this invention, the suction eye has the form of a duct or tube disposed in axial alignment with the impeller, there are fixed deflector vanes located within the suction eye to impart swirl to the dust-laden air or gas passing therethrough, and there is an annular deflector located adjacent the junction of the tubular suction eye with the fan casing and having a section which provides one flange directed into the tubular suction eye and another flange directed outwardly radially into the fan casing, the said flanges being spaced from the walls of the fan casing and of the tubular suction eye.

Thereby, by reason of the swirl imparted to the dust-laden air or gas by the fixed vanes in the tubular suction eye, the major portion of the dust contained in the air or gas will be thrown centrifugally on to the inner wall surface of the suction eye and thence will pass through the annular space between the said wall surface and the flange of the annular deflector which is directed into the suction eye, the said dust subsequently being deflected by the outwardly directed flange of the annular deflector into the fan casing. Thus, the major portion of the dust will by-pass the impeller blades, and relatively dust-free air will pass through the annular deflector and between the fan blades, thereby mitigating abrasion of the blades.

Referring to the drawings accompanying the Provisional Specification:—

Fig. 1 is an axial sectional elevation of a fan incorporating one embodiment of the invention;

Fig. 2 is an axial sectional elevation of a fan incorporating a modified embodiment of the invention; and

Fig. 3 is a part end elevation of the annular deflector shown in Fig. 2, looking in the direction of the arrow III in Fig. 2.

In Fig. 1, the fan impeller 1, mounted on a driving shaft 2, is located for rotation in a fan casing 3.

The suction eye for entry of gas or air to the fan is provided by a tube 4 which is secured to the fan casing 3 in axial alignment therewith and is provided with a bell-mouthed entry 6. The air or gas is discharged from the fan casing 3 through an outlet 7.

Within the tubular suction eye 4 there are a series of vanes 5 which are immovable, the said vanes being so shaped as to impart swirl to the air or gas which is drawn into the fan by the rotating impeller 1.

An annular deflector 8 is secured to the impeller 1 in axial alignment therewith so that the deflector rotates with the impeller. The deflector 8 is disposed on that side of

[*Price*

the impeller which is adjacent to the tubular suction eye 4, and has an angular section which provides a tubular flange 9 which projects from the impeller into the tubular suction eye 4 and is spaced radially from the inner wall surface 10 of the suction eye to leave an annular passage 11, and an outwardly radial flange 12 which extends into the fan casing 3 and is spaced from the adjacent wall 3a of the fan casing, the outer diameter of the flange 12 being greater than the internal diameter of the suction eye 4 at the annular passage 11 so that the exit from said passage is shielded by the flange 12 to prevent direct flow of dust from the passage 11 on to the blades of the impeller 1.

It will be seen that dust which is thrown centrifugally on to the wall surface 10 of the suction eye, by reason of the provision of the vanes 5, will pass through the annular passage 11 and be directed by the flange 12 outwardly radially into the fan casing 3. Thus, there will be little dust passing through the blades of the impeller to effect abrasion of said blades.

Experimental testing has shown that closely adjacent to the suction eye and within the fan casing there is sufficient depression, below the suction pressure of the gas or air developed in the outer portion of the fan casing, to ensure a flow of dust into the casing from the inner wall surface of the suction eye. Even at relatively low gas outputs from the fan, when the pressure within the casing is positive in relation to the pressure in the suction eye, and recirculation of the dust from within the casing back to the suction eye takes place, this recirculation is of such a relatively minor character that the air flow is sufficient to maintain the dust in suspension.

Greater length of service and less frequent replacement of fan impellers, or the blades thereof, dealing with heavily dust-laden air or gas is ensured, while maintaining a reasonably high efficiency as a fan unit.

Renewal and replacement of the elements may be effected readily. The annular deflector 8 at the fan eye can be of a suitably surface-hardened material.

In some cases the annular deflector 8 is stationary, being secured to the fan casing 3 or to the tubular suction eye 4 at a position adjacent to the impeller 1. An example of such a construction is shown in Figs. 2 and 3. The annular deflector 8 is secured to the fan casing by wings 13 on the periphery of the flange 12, spacing members 14 being disposed between said wings and the wall of the casing 3, and screw studs 15 passing through the casing wall into the spacing members and the wings. Conveniently and preferably, the wings 13 extend from the flange 12 substantially tangentially thereto and project in the direction towards which the impeller 1 rotates, a seen in Fig. 3 wherein the arrow 16 indicates the direction of rotation of the impeller.

In a modified form, the annular deflector has a section which is substantially arcuate.

It will be understood that though the invention has a particular application for impellers of the paddle type as portrayed in the drawings, it can be applied to impellers of other designs where the inter-relation of the physical conditions within the suction tube and fan casing make the system applicable.

WHAT WE CLAIM IS:—

1. A rotary fan having an impeller disposed within a fan casing, with a suction eye, for the inlet of dust-laden air or gas to the fan casing, disposed in axial alignment with the impeller, characterised in that the suction eye has the form of a duct or tube, there are fixed deflector vanes located within the suction eye to impart swirl to the dust-laden air or gas passing therethrough, and there is an annular deflector located adjacent the junction of the tubular suction eye with the fan casing and having a section which provides one flange directed into the tubular suction eye and another flange directed outwardly radially into the fan casing, the said flange being spaced from the walls of the fan casing and of the tubular suction eye.

2. A rotary fan according to claim 1, wherein the said annular deflector has an angular section.

3. A rotary fan according to claim 1, wherein the said annular deflector has a substantially arcuate section.

4. A rotary fan according to claim 1, 2 or 3, wherein the annular deflector is secured to and is rotatable with the impeller.

5. A rotary fan according to claim 1, 2 or 3, wherein the annular deflector is secured to the fan casing so that the impeller rotates relatively to the said deflector.

6. A rotary fan according to claim 5, wherein the annular deflector is provided with wings on its periphery and the said wings are secured to the wall of the fan casing with interposed spacing members.

7. A rotary fan constructed and arranged substantially as described herein and shown in the drawings accompanying the Provisional Specification.

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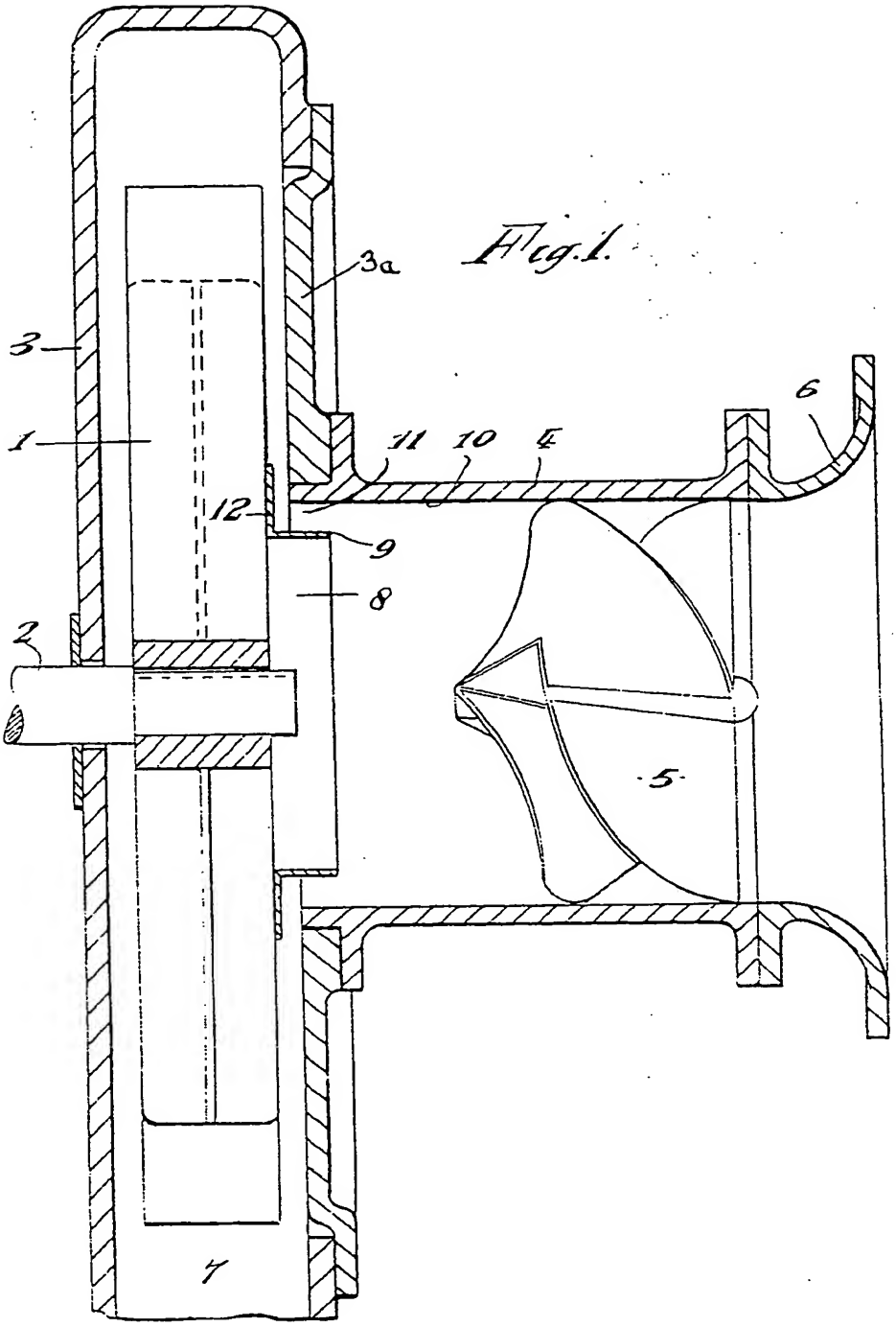

Fig. 1.

940.922 PROVISIONAL SPECIFICATION

2 SHEETS

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SHEETS 1 & 2

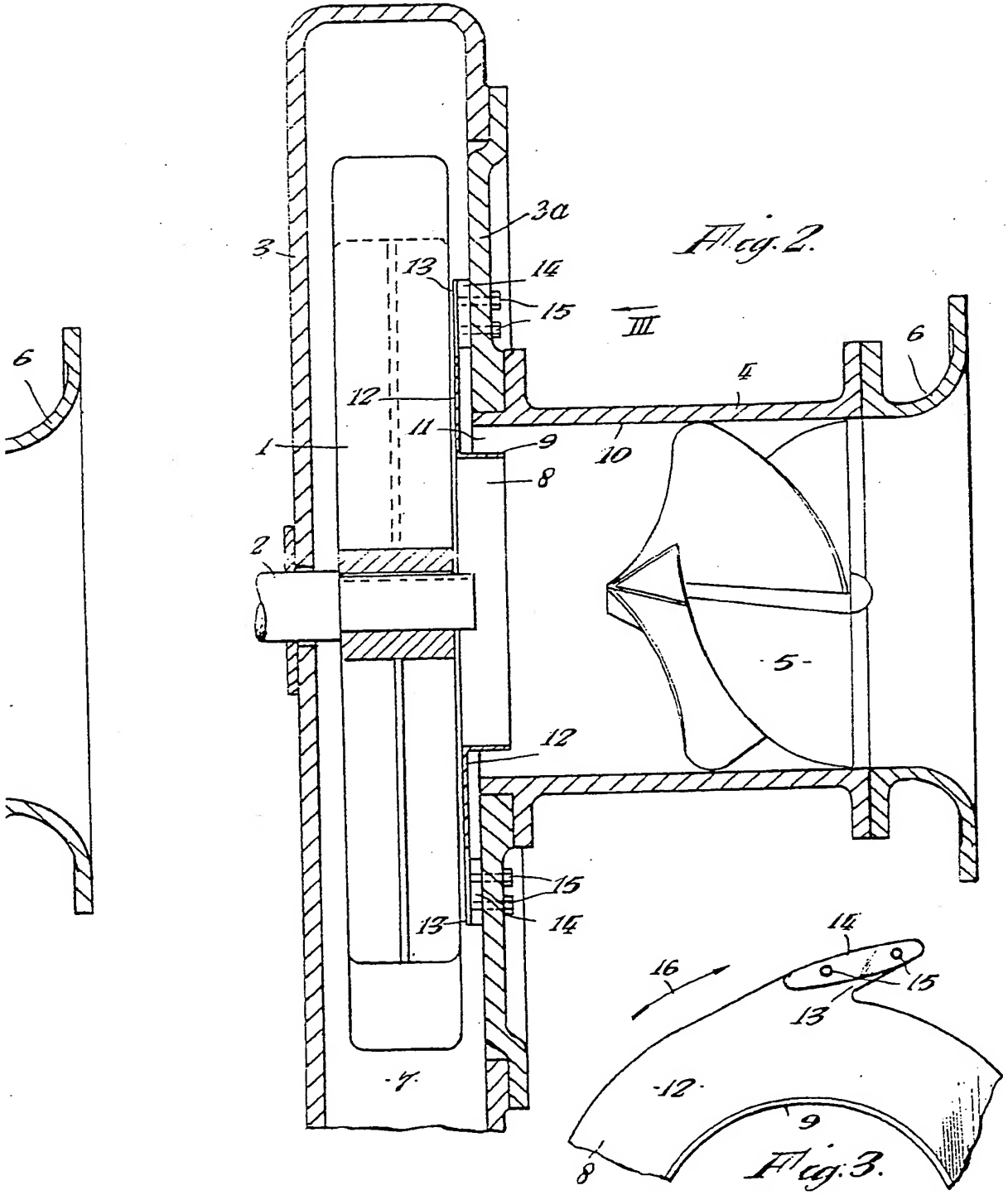

Fig. 2.

Fig. 3.

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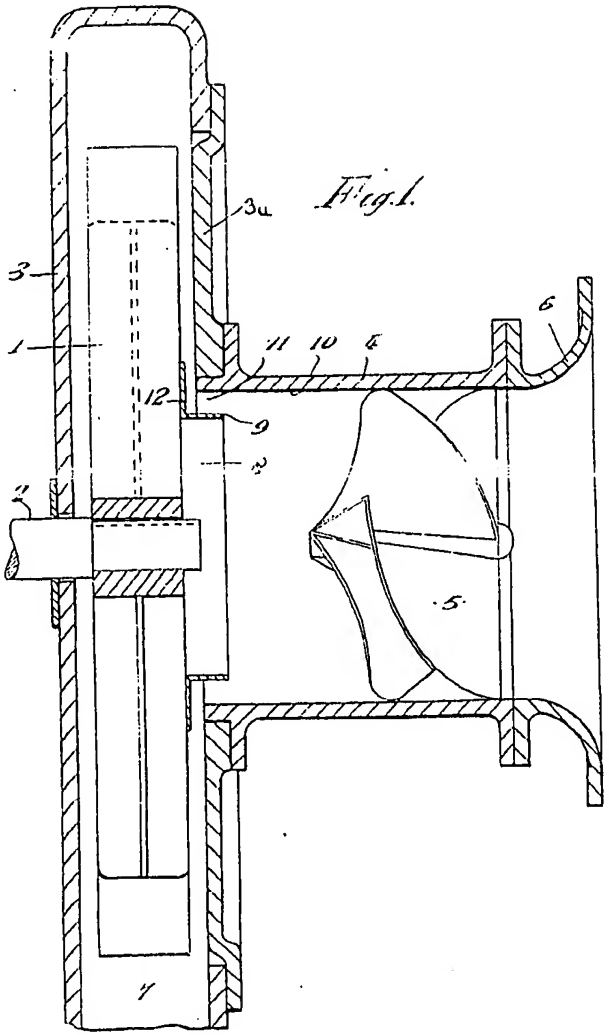

Fig. 1.

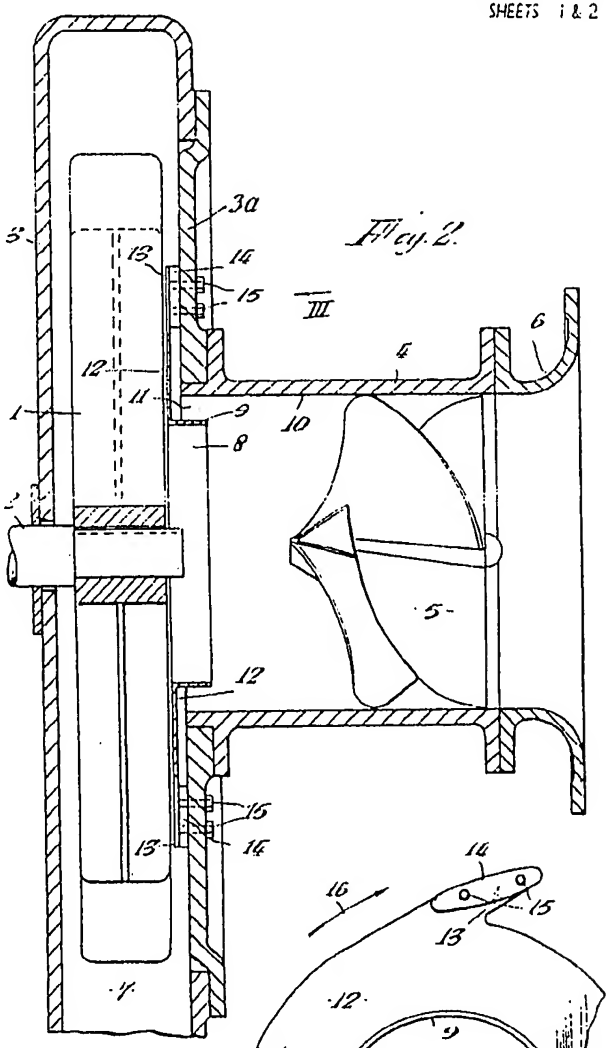

Fig. 2.

Fig. 3.